



State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE MANAGEMENT

John J. Trela, Ph.D., Acting Director

401 East State St.

CN 028

Trenton, N.J. 08625

609 - 633 - 1408

March 25, 1988

MEMORANDUM

TO: Distribution List

THROUGH: Dennis Hart, Section Chief

Bureau of Case Management

FROM: Chris Altomare, Case Manager

SUBJECT: UOP- Biodegradation Feasibility Study

The attached document/information on the above named facility is for your:

- ☒ Review and comment
- ☐ Information and/or file
- ☐ Action
- ☐ Other

Should you have any questions or if you are unable to meet the due date please contact me at 3-0701.

Due Date: April 25, 1988

Activity Code: 7BV

Distribution:

FYI
Only

- [] Linda Welkom, Geologist, Division of Water Resources
- [] Kevin Schick, Technical Coordinator, BEERA
Division of Hazardous Site Mitigation
- [X] Mike Schuit, Regulatory Officer, Office of Regulatory
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- [] _____, Bureau of Community Relations
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- [] Frank Cosolito, Division of Environmental Quality
- [] Janet Feldstein, USEPA
- [] Andy Marinucci, BEERA
- [] _____

Please complete your review
as soon as possible. UOP
would like to implement the
Biodegradation of the Lagoons
over the summer 1988.

Approval and permits would
require expeditious handling.

c: Karen Jentis, Chief, Bureau of Case Management w/o attachments
Superfund Coordinator, DWR w/o attachments

WASTEWATER LAGOONS BIODEGRADATION FEASIBILITY STUDY

UOP SITE, EAST RUTHERFORD, NJ

PROGRESS SUMMARY AND PRELIMINARY REPORT

ON THE SCALED-UP TREATMENT

EXPERIMENTAL DESIGN SUMMARY

Biodegradation of priority pollutants in a 3.3/1, sludge/meadow mat mixture from lagoon 1 was evaluated in a solid matrix. The mixture was blended with the best nutrient treatment from the primary screen and divided into two portions, a wet and dry treatment. The wet treatment simulated field conditions by maintaining the original saturated conditions of the sample matrices. The dry treatment was allowed to dry to 50-70% field capacity gradually in the laboratory during treatment.

Appropriate adjustments in moisture content were made by weighing the entire reaction flat and adding water as necessary. Treatments were maintained at pH 7.0, 28°C, and cultivated three times daily. 22-24°

Progress of this biodegradation treatment was monitored according to the following matrix in both wet and dry treatments after day 0. Samples for analysis of day 0 parameters were taken from the homogenized mixture before division.

<u>Day</u>	<u>Microtox</u>	<u>Plate Count</u>	<u>HSL+30</u>	<u>BTX</u>	<u>HO&G</u>	<u>Nutrients</u>
0	x	x	x		x	x
3	x					
7	x					
10	x					
14	x	x			x	x
21	x			x	x	
29	x					
35	x	x	x		x	

RESULTS

Table 1 summarizes Microtox, HO&G and BTX for the 35 day treatment period. Toxicity remained constant in the wet matrix but decreased significantly after day 10 in the dry treatment. The concentration of hydrocarbon oil and grease decreased steadily from the calculated value in both treatments. BTX fell below detectable limits after 35 days in both treatments although toluene and xylene were present in both treatments at day 21.

Table 2 provides the calculations used to determine the calculated values in Table 1 and Table 4. The analytical data from the individual characterization of sludge 1 and meadow mat 1 was used.

Table 3 summarizes the results of the HSL analysis at day 0 and day 35. Volatiles and BNA extractables decreased in both treatments. Pesticides reported were attributed to matrix interferences and can not be confirmed.

Table 4 shows the nutrient and bacterial plate count data for both treatments. The wet treatment had a higher concentration of soluble ammonia, nitrate and phosphorus than the dry.

CONCLUSIONS

- 1) The initial toxicity screen predicted that organic components of the sludge sand meadow mats were biodegradable without dilution to reduce overall toxicity. This was confirmed by a scaled-up biodegradation demonstration of the most toxic sludge/meadow mat mixture.
- 2) In the scaled-up treatment 85 ppm hydrocarbon oil and grease was consumed per day. At this rate, reduction of 4600 ppm to a residual of 1000 ppm would require 42 days, 100 ppm 53 days.

- 3) Volatile priority pollutants as represented by benzene, toluene and xylene were removed during the first 21 days of incubation.
- 4) Overall toxicity of lagoon 1 sludge/meadow mat mixture decreased rapidly after 14 days of incubation at 50-70% field capacity.

TABLE 1
SCALED-UP SOLID MATRIX TREATMENT
OF SLUDGE #1/MEADOW MAT #1 MIXTURE

DAY	MICROTOX		HO&G		BTX					
	EC ₅₀ ¹		mg/kg		BENZENE		TOLUENE		XYLENE	
	D ²	W ²	D	W	ug/kg		ug/kg		ug/kg	
CALC. ³			NA	4,511	NA	12,777	NA	36,446	NA	4,933
0	18.7	18.7	NA	2,037	NA	3,800	NA	10,000	NA	3,400 <i>HSC Anal.</i>
3	15.7	24.2	NA	NA	NA	NA	NA	NA	NA	NA
7	18.8	27.8	NA	NA	NA	NA	NA	NA	NA	NA
10	22.7	24.2	NA	NA	NA	NA	NA	NA	NA	NA
14	72.2	26.1	3,130	3,370	NA	NA	NA	NA	NA	NA
21	80.8	24.6	2,800	2,300	<1	7	20	45	18	77
29	80.3	22.5	NA	NA	NA	NA	NA	NA	NA	NA
35	81.7	26.5	1,550	1,680	<5	<50	<5	<50	<5	<50

Shown on two graphs

¹Adjusted to 10g dry weight sample

²D = Dry (50-70% field capacity), W = Wet (field capacity)

³From initial matrix characterization using 23.3% meadow mat #1, 76.7% sludge #1 (See table 2)

TABLE 2
PREDICTED VALUES BASED ON
INITIAL SAMPLE CHARACTERIZATION

Calculations:

3,000g MM #1

9,900g Sludge #1

12,900g Total

$\frac{3,000}{12,900} = 23.3\%$ MM #1

$\frac{9,900}{12,900} = 76.7\%$ Sludge #1

	<u>ACTUAL</u>		<u>CALCULATED</u>
	MM #1	Sludge #1	Mixture
Hyd. O & G	1,825	5,327	
x%	425.3	4,085.8	4,511 ppm
Benzene	8,750	14,000	
x%	2,038.8	10,738.0	12,777 ppb
Toluene	84,000	22,000	
x%	19,572	16,874	36,446 ppb
Xylene	5,700	4,700	
x%	1,328.1	3,604.9	4,933 ppb
NH ₃ -N	369	29.1	
x%	86.0	22.3	108 ppm
NO ₃ -N	246	103	
x%	57.3	79.0	136 ppm
P	110	106	
x%	25.6	81.3	107 ppm
CFU/ml	0.14×10^7	19.0×10^7	
x%	0.03×10^7	14.6×10^7	14.6×10^7

TABLE 3
HSL SUMMARY

COMPOUND (UG/KG)	TIME AND TREATMENT		
	0	35W	35D
Benzene	3,800	<50	<5
Chlorobenzene	2,400	<50	<5
Ethylbenzene	2,000	<50	<5
Toluene	10,000	<50	<5
<u>Methylene Chloride</u>	<u><1,000</u>	<u>970</u>	<u>34</u>
Total/Volatiles	18,200	970	34
o-Xylene	3,400	<50	<5
4 Methylphenol	<33,000	<540	470
Bis (2-ethylhexyl)phthalate	<33,000	<540	400
1,2-dichlorobenzene	43,000	7,000	<330
<u>2,4-dinitrotoluene</u>	<u><33,000</u>	<u>1,200</u>	<u>500</u>
Total/Base/Neutral/Acid Extractables	46,400	8,200	1,370
Aldrin	<500	1,700	<2,000
beta BHC	<500	830	<2,000
delta BHC	<500	1,600	2,500
<u>heptachlor</u>	<u><500</u>	<u>900</u>	<u><2,000</u>
Total/Pesticides	<500	5,030	2,500

All others on HSL < detection limit for all times and treatments.

NUTRIENTS AND CELL COUNTS FOR SCALE UP TREATMENT

[illegible]